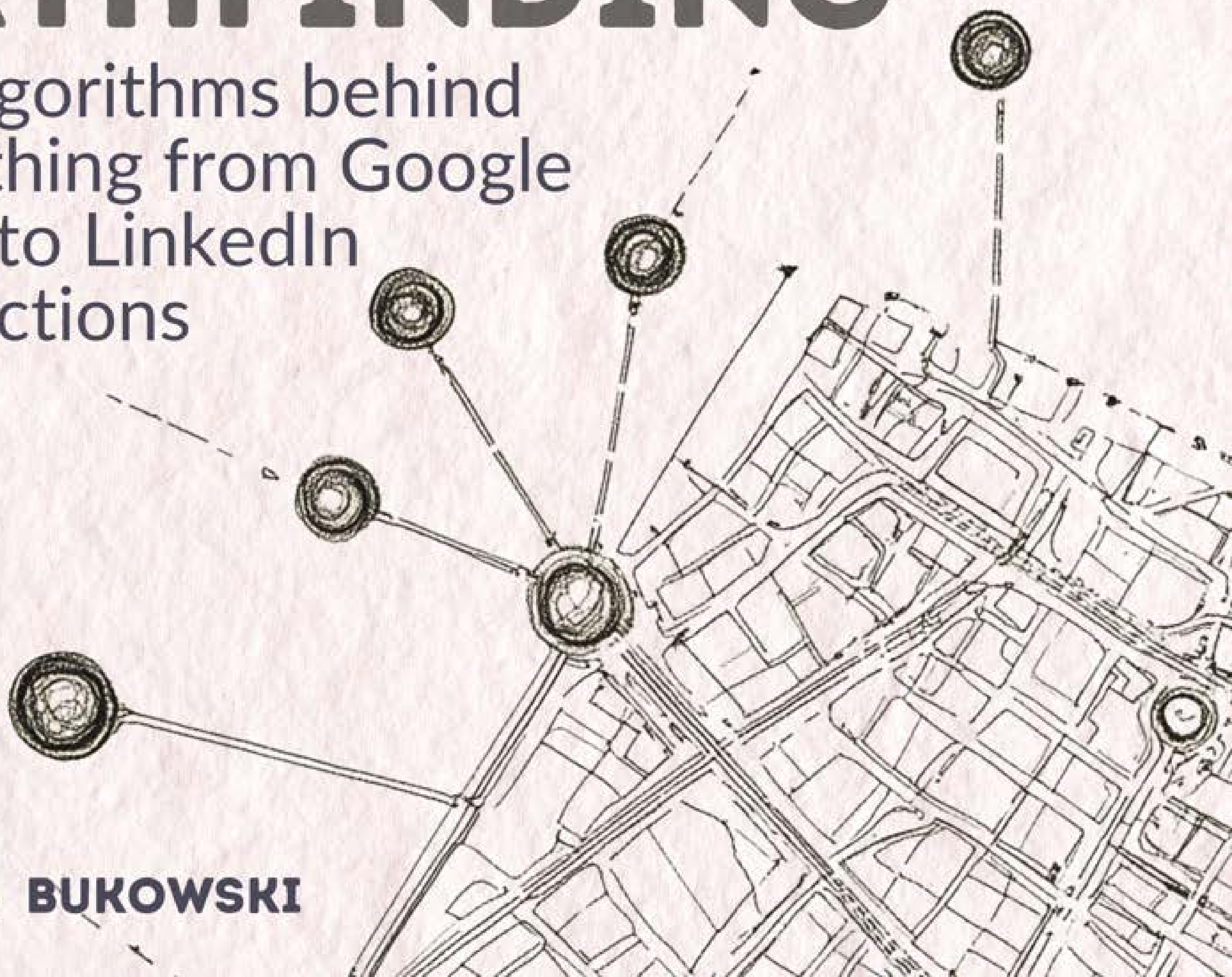
NAVIGATING NETWORKS: THE POWER OF GRAPH PATHFINDING

The algorithms behind everything from Google Maps to LinkedIn connections



DANIEL BUKOWSKI

THE HIDDEN INTELLIGENCE OF CONNECTED SYSTEMS

The systems you use daily rely on graph pathfinding algorithms to navigate relationships.

Here's how they work and why they matter for business, technology, and everyday life.

1. GRAPH FUNDAMENTALS

Graphs use **nodes** to represent entities like people or locations and **edges** to show the relationships between them.

This provides a framework for representing the connections that exist in your data.

2. PATHFINDING IN ACTION

Pathfinding algorithms are the foundation of many daily conveniences. They power systems that:

- determine the shortest route for your GPS,
- suggest connections on social networks, and
- route internet traffic.

3. PATHFINDING EXPLAINED

Pathfinding algorithms identify optimal routes between nodes based on specific criteria like number of connections as well as relationship "weightings" like cost or time.

Here are three examples that use different approaches to identify optimal paths.

4. BREADTH-FIRST SEARCH (BFS)

BFS examines all the immediate neighbors of a node before moving to the next level, creating ripple-like expansion out.

This approach guarantees that it will identify paths with the fewest connections.

5. DIJKSTRA'S ALGORITHM

Dijkstra's algorithm finds shortest paths in weighted graphs by systematically selecting nodes with the smallest known distance.

The enables it to calculate optimal routes based on factors like distance, toll costs, and traffic delays.

6. A* ALGORITHM

A* accelerates pathfinding by combining actual distance traveled with an estimated remaining distance to the destination.

This approach focuses exploration towards a goal, making it ideal for use with AI and robotics.

7. CHOOSING THE RIGHT ALGORITHM

The optimal pathfinding algorithm depends on your graph and use case:

- **BFS** works best for unweighted graphs.
- **Dijkstra's** guarantees optimal weighted paths.
- **A*** provides efficiency through goal-directed search.

These principles enable the intelligence behind today's most powerful connected systems.

This is why at data2 we built the reView AI platform using graphs.

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